

## No evidence of an association between lethal recessive Osteopetrosis and performance in dairy cattle.

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### Background

- Paris climate agreement 2015 was signed by 175 parties including Ireland. The central aim of this is to keep the global temperature rises below pre-industrial levels by lowering GHG in a manner which doesn't threaten food production.
- High genetic merit cows have reduced emissions of 24% (Ross, et al., 2014).
- There is an estimated 7.6 billion people on earth right now and this is estimated to rise to 9.8 billion by 2050. That's 2.2 billion more people in the next 30 years!
  - More people = More food required = More emissions.
- Remember, high genetic merit cows have up to 24% less emissions.

### Objectives

The purpose of this study was to determine if carriers of lethal recessive genetic disorder Osteopetrosis (OS) was associated with positive or negative effects on fertility, carcass and milk production traits.

Osteopetrosis is a lethal recessive genetic disorder of gene *SLC4A2*, which codes for a protein necessary for proper osteoclast function. Affected calves are most often stillborn prematurely or survive less than 24 hours. Carriers are relatively unaffected.

Recessive genes can be managed if proven advantageous or selected against if not.

Ultimately reduce resources wasted and emissions created when carrying non-viable calves to term.

### Methods

Genotypes and phenotypes in the form of predicted transmitting abilities (PTAs) of 14,939 dairy cattle were obtained from the Irish Cattle Breeding Federation.

The PTAs were deregressed and using a weighted mixed animal model, were analysed in ASReml for an association with the SNP. The adjusted reliability cut-off was set at >20% resulting in the following n numbers from the 14,939 animal population.

### Results

No association ( $p > 0.05$ ) between polymorphism responsible for Osteopetrosis was observed in the following traits:

- Fertility: calving interval ( $n=2467$ ), calving difficulty ( $n=3237$ ), gestation length ( $n=12688$ ), or maternal calving difficulty ( $n=2157$ )
- Carcass: carcass weight ( $n=4414$ ) or culled cow weight ( $n=5111$ )
- Milk ( $n=14773$ ): milk yield, milk fat yield, milk fat percent and milk protein percent.

A tentative association ( $p < 0.1$ ) between Osteopetrosis and increased milk protein yield (5.25 kg, s.e. 2.79) and decreased somatic cell score (-0.32, s.e. 0.19,  $n=6155$ ) was observed.

### Conclusion

Somatic cell score is the measure of somatic cells, usually leukocytes, found in milk. A lower score equals better animal health, higher quality milk and financial reward for the farmer by higher milk price paid.

Although there was a tentative association between increased milk protein yield and decreased somatic cell score which are both desirable, the results provide little evidence to support the maintenance of carrier animals of Osteopetrosis.

### Expected outcomes of further research

Further analysis for associations between this lethal recessive genetic disorder and additional production traits should be undertaken to justify the maintenance of carrier animals in the herd.

The implications of this research is to increase the genetic merit of cows, in order to require less resources to produce the same or more food and sustain the growing population. Additionally, this will contribute to the reduction of GHGs from agriculture therefore adhering to regulatory requirements such as the Paris agreement and stricter future guidelines which will inevitably occur.

### References

Ross, S. A., Chagunda, M. G., Topp, C. F. & Ennos, R., 2014. Effect of cattle genotype and feeding regime on greenhouse gas emissions intensity in high producing dairy cows. *Livestock Science*, Volume 170, pp. 158-171.